CHAPTER III.

VENTILATION.

THE CONSTITUENTS OF THE AIR.—It has been found that in certain manufactories and machine shops that the air is so filled with certain impurities that 30 years is the maximum age attained by the operatives. Such instances (and they may be multiplied), though they indicate criminal neglect in the management, are fortunately exceptional, and need not be considered here.

The impurities that we shall consider under this head, as concerning ventilation, result from the *breathing of men and animals and the burning of gas, oil, etc.*, in illumination and heating.

Country air, wherever analyzed, is found to contain in volume nearly 1-5 *oxygen* to 4-5 *nitrogen*, with small variable amounts of aqueous vapor, ammonia, carbonic acid and certain microscopic organisms, besides dust, etc.

If phosphorus is burnt in a bell jar, placed over water, it combines with nearly all of the oxygen in the confined air, forming white fumes of "phosphorus pentoxide" that are soon entirely absorbed by the water, leaving nearly pure nitrogen in the jar. The water rises so as to fill about one-fifth of the original air space in the bell jar, thus showing that the substance (oxygen) abstracted is nearly one-fifth by volume of the whole. The gas (nitrogen) now remaining in the jar is colorless, inodorous, and does not support combustion or animal life. Pure oxygen gas, (which is readily obtained separately by heating mercury oxide or potassium cholorate, etc.), is likewise colorless and inodorous, but it supports combustion readily—iron even burning (oxidizing) in it with great brilliancy.

The oxygen is the life-giving principle of the air. An animal, however, exposed to pure oxygen gas is overstimulated to such an extent that it soon dies. The nitrogen, therefore, acts as a diluent of the oxygen, and it is found that the above proportion of 4 to 1 cannot be much varied from without deleterious con-